

ECOLOGICAL AND ECONOMIC RELATIONS
OF THE CROW, WITH SPECIAL
REFERENCE TO ILLINOIS

BY
CHARLES THEODORE BLACK

A.B., University of Illinois, 1935

M.S., University of Illinois, 1937

AN ABSTRACT OF A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
ZOOLOGY IN THE GRADUATE SCHOOL OF THE
UNIVERSITY OF ILLINOIS, 1941

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INTRODUCTION

The crow is a large and numerous, and therefore ecologically and economically important, member of the present-day agricultural complex. Despite familiarity with general habits and a general knowledge of food, details of nest life and migration have not been known and specific food habits in Illinois have only been conjectured. Depredations, real and fancied, upon corn and other crops, poultry, and the eggs and young of song and game birds have led to persecution, frequently beyond the degree warranted by the damage done and without consideration of beneficial habits. This is especially true in Illinois, where without an accounting, the crow has been subjected to intensive gun-pressure and bombing of roosts. Investigations of these problems were undertaken from September, 1937, until August, 1939. The study was carried on over the entire state of Illinois, with Champaign County receiving special consideration.

METHODS

In general, extensive rather than intensive techniques were employed. Over 250 nests were visited; over 450 birds were banded; and the sex of over 3,000, the age of over 16,000, and the weight of over 800 birds were determined. The population of an entire county and an entire state was estimated, and the survival, longevity, and migratory status over the entire range were conjectured from analysis of recoveries of over 800 birds banded over a 25-year period. The winter food in Illinois was determined by analysis of over 700 stomachs and over 1,200 pellets. Farmer opinion and estimate of damage were summarized from over 400 returned questionnaires.

LITERATURE

Burns (1895) and Bendire (1895) early summarized the bare outline of life history, but both mis-stated the incubation period. Food and economic status for the nation as a whole were reported upon by Barrows and Schwarz (1895) and Kalmbach (1918). The winter roosting habit has been summarized effectively by Kalmbach (1916). The winter crow population of an entire state (New York) has been estimated by Emlen (1938), and quantitative analysis of damage to crops in Oklahoma was made by Imler and Kalmbach (1939). There has been little specific reference to Illinois conditions.

REPRODUCTION

The incubation period is 19 days, commencing in earnest with the laying of the third egg. Incubation is performed only by the female, who is frequently fed on the nest by the male. In normal incubation behavior the female's attentive periods average about one and one-half hours and her inattentive periods about four minutes. The young remain in the nest for 24 to 30 days and during early nest life are fed by both parents about once every 35 minutes. After leaving the nest the young are fed by the parents for two to three weeks. There is no evidence that crows possess territory other than the nest itself. Courtship consists of flight maneuvers, posturing, and song, and continues into the incubation period. In Champaign County nests were located in trees of 28 species but most frequently in the commonest trees of the habitat. The height of the nest above the ground varied with the height of the tree. As a rule a new nest was built each year. The materials for constructing the nest were obtained from the immediate surroundings and consisted chiefly of twigs and plant stems and a lining of grape-vine bark. Nests were most frequently located in forest-edges, open woods, and along field boundaries. The gonads of adult birds begin to increase in size in January and attain maximum development late in March. Young birds do not breed the first season after hatching, and their gonads,

when near maximum, average one-sixth the size of gonads of the breeding adult.

LIFE EQUATION

The life equation of the crow indicates that of each 100 eggs laid, 71 hatch, and 53 young reach banding age. Twenty-three birds survive at the end of the first year, and 15 are alive at the end of their second year and breed. Twelve birds survive at the end of the third, 8 at the end of the fourth, 4 at the end of the fifth, 2 at the end of the sixth, 1 at the end of the seventh, and none at the end of the eighth year. Crows rarely exceed this life span, but an age of at least 14 years has been recorded for one bird. The major factors contributing to mortality are nest destruction, competition in the nest, shooting, dynamiting, and disease.

POPULATIONS

The Illinois crow population reaches a winter maximum of 21 birds per square mile, which is reduced by mortality and migration to a breeding season figure of 10 birds per square mile, which includes both breeding and non-breeding birds. Winter roosts are distributed over the entire state, but are most numerous in central Illinois at the southern edge of the "black prairie". The winter population is greatest here, where there are large numbers of large and small roosts, and in the southern third of the state, where an equal number of birds roosts nightly in a few very large roosts in the bottomlands of the Mississippi, Ohio, and Wabash Rivers. In the winter population, males slightly predominate among adults in all parts of the state. Among birds of the year the proportion of males is high in the northern part of the state but declines progressively southward. Considering both age groups for the entire state the sexes rank equal in number. In the winter population adult birds are almost twice as numerous as birds of the year. Males average heavier than females, and adults, heavier than birds of the year. Winter crows increase in weight northward at a rate approximating 1.5 percent of

the body weight for each degree of latitude, and winter weights are greater than summer weights by about six percent of the body weight. Comparison with other regions indicates a decrease in crow weights westward.

SEASONAL MOVEMENTS

Crows nesting north of the 43d parallel of latitude in eastern and central North America are mostly migratory and those nesting south of it are mostly resident. Migration flights of eastern and mid-western crows average about 300 miles, while those of Central Plains crows average about 1,000 miles. The direction of migration varies from a northeast-southwest axis in the Atlantic coastal region and the vicinity of the lower and middle Great Lakes, to a north-south axis in the central Mississippi valley, and northwest-southeast axis in the Central Plains region.

FOOD

Corn comprises over 90 percent of the winter food of the crow in Illinois. This is practically all waste corn left scattered over the fields. Smooth sumac, mice and shrews, and carrion are eaten in appreciable quantities. Incomplete data indicate the food during the warmer months of the year to be principally insects and corn, with eggs and young of wild birds and poultry playing an unimportant role. Recent life history studies of game birds show that the crow is not an important destroyer of nests.

ECONOMIC STATUS

Farmers estimated their 1938 losses due to crows from two cents per acre in the northern part of the state, to nine cents per acre in extreme southern Illinois. Damage to corn was uniformly slight over most of the state, but was locally severe in the extreme south. Losses of poultry were locally severe over most of the state, suggesting the continued activity of crows nesting near particular farmyards. The farmers

were uninformed of the importance of the insect-eating and rodent-eating habits of the crow, and overestimated the depredations on wildlife. Four-fifths of the farmers responding to questionnaires considered that crows did more harm than good. However, two-thirds did not consider losses from crows sufficient to justify expenditures for crow control.

MANAGEMENT

The destruction of nests near farmyards, the use of coal-tar as a deterrent on seed-corn, and the proper fencing and housing of poultry are management measures recommended to decrease losses from crows. Bombing is not recommended as a general control measure.

VITA

Charles Theodore Black was born at Chicago, Illinois, January 24, 1914. He attended elementary and high schools in Chicago, graduating in 1931. From 1931 to 1932 he attended Northwestern University, Evanston, Illinois. From 1932 to 1939 he was a student at the University of Illinois, receiving the A.B. degree with highest honors in zoology in 1935, and the M.S. in 1937. From 1935 to 1939 he was successively assistant and fellow in the Department of Zoology of the University of Illinois. In the summer of 1933 he served as an assistant at the Alleghany School of Natural History, Quaker Bridge, New York. During the summer of 1937 he spent six weeks at the Chesapeake Biological Laboratory, Solomon's Island, Maryland. From September, 1939, to April, 1940, he was a research assistant in the Department of Game Management of the University of Wisconsin, which position he left at the latter date to take up his duties as game research ecologist with the Michigan Department of Conservation. At present he is located at the Rose Lake Wildlife Experiment Station of the latter Department. He is a member of Sigma Xi and Phi Sigma.

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